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ABSTRACT

The report is the first in a series being published on the results of work carried out under an OECD program to promote cooperation among member countries for improving the quality, speed, and cost-effectiveness of school construction. Symposium proceedings are summarized that examine the development of the school building process in the light of social and economic pressures and discuss the briefing and design stages of a school building project, providing for future change, methods of building, research and development, and school building and the teaching profession. (Author/MLF)

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SCHOOL BUILDING AND EDUCATIONAL CHANGE

BY ERIC PEARSON

EA 006 959

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
Paris 1975

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The Programme on Educational Building (PEB) was established by the Council of the Organisation for Economic Co-operation and Development as from January 1972. Its present mandate expires at the end of 1976.

The main objectives of the Programme are:

- to facilitate the exchange of information and experience on aspects of educational building judged to be important by participating Member countries;
- to promote co-operation between such Member countries regarding the technical bases for improving the quality, speed and cost effectiveness of school construction.

The Programme functions within the Directorate for Social Affairs, Manpower and Education of the Organisation in accordance with the decisions of the Council of the Organisation, under the authority of the Secretary-General. It is directed by a Steering Committee of senior government officials, and financed by participating governments.

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PREFACE

The growing social demand for education, increasing mobility of population, structural changes in secondary education, and a continuous reappraisal of educational theory and practice have given rise to a number of new problems affecting school building. These involve educational, economic, architectural and technological considerations for which conventional school building solutions are often outdated, inadequate and wasteful.

Architects, administrators and educators are working together to seek new solutions to the unfamiliar problems facing them. Their work is leading to new approaches to school building and is reflected in many different ways in recent school plans. Standard classrooms are giving way to a great variety of forms of teaching space. There are still areas for formal instruction, lectures or demonstrations, but space is also provided for work in small groups, for discussions, for seminars; for independent study and investigation; for teams of teachers to discuss common projects and prepare teaching materials, and for accommodating the new teaching/learning resources.

Such variety aims at providing a close match between the vastly increased range of educational activities and the corresponding facilities needed in terms of spatial provision, equipment and furniture, and services. Coupled to this is the emergence of much deeper and less regularly cellular plans arising from the need closely to inter-relate comparatively large areas of accommodation and reflecting the trend away from rigid subject specialisation towards the integration of activities. A common theme often discernible is thus a desire for less rigidly predetermined spaces reflecting the need for teachers to be able to seize a learning opportunity and to structure a teaching situation around it.

The breakdown of the class-centred structure demands alternative approaches to the problems of administrative and social organisation: each pupil must have a place with which he can identify - a "home" or "base" in which he can meet his friends, keep personal possessions and where he can find and be found by the member of staff responsible for his

welfare and progress in the school. In addition, the changing relationship between teacher and pupil call for an ambiance less institutional in character than is often the case. Carefully chosen furnishings and finishes help give a more domestic feeling: soft upholstery, carpets, curtains and pictures increasingly form a part of the vocabulary of school-building design.

The search for new answers to the new problems necessitates a certain freedom of choice for school building designers and a consequent plurality of solutions. It can only be successful if backed by the continuous analysis of educational and technological developments, the testing of the results of those investigations in individual projects, the methodical evaluation of such projects in use, and the feedback of experience so gained. This requires wide participation and consultation in decision-making by public representatives, officials, parents, teachers, etc., and new forms of collaboration between educationists, administrators and architects.

It was against this background, and in the context of the work under the OECD Programme on Educational Building, that the Symposium which is the subject of the present report, was organised in October 1973 in Buxton, Derbyshire, England.

The Secretariat wishes to acknowledge the generous help of the Department of Education and Science, the Derbyshire County Council and the Local Education Authorities of neighbouring counties as well as the Borough of Buxton. Their contribution and hospitality made the Symposium a rewarding and pleasurable experience. Particular thanks are also due to the rapporteur, Mr. Eric Pearson, formerly Member of Her Majesty's Inspectorate, whose vivid perception and style make the Symposium come alive again in the pages that follow.

I. GENERAL CONSIDERATIONS

Objectives of the Symposium

1. Early in 1973 the Steering Committee for the Programme on Educational Building (PEB) considered that a point had been reached in its work when a fresh look at school building objectives and procedures was needed, and it was for this purpose that the Symposium was convened. Educationists and architects have differing concerns and post-war school building is often seen as the struggle to co-ordinate their efforts through common objectives rather than them being diametrically opposed through a misunderstanding of each others views. The form-defying curriculum of the multi-option school and the range of choice allowed within it, the informal methods of teaching employed and the wide opportunities required for the social life and leisure of the pupils, are often seen by the architect as incapable of resolution into a clear architectural form. Architects have sometimes seen it as their duty to bring organisational and structural clarity to this seeming chaos and produced formal buildings which have been received with little enthusiasm by the users.

2. Nevertheless, a feature of school building in recent years has been the development in some countries of an empirical school of design, free from all formal preconceptions as to the image and character of school. Faced with complicated and changing educational and social aspirations, policy-makers, educationists, architects and hosts of other professional people concerned with school building have worked together to reach a common understanding as to recognisable goals, each participant making his own special contribution. In the wake of this movement, the time was opportune for an examination of the course of educational change, and its implications for school building, and for a re-appraisal of existing standards and procedures. The search for new solutions to meet changed and more complicated educational demands, requires administrative structures within which architects have greater freedom to consider and interpret the wishes of their clients, unrestricted by out-of-date norms and procedures.

Arrangements for Discussion

3. Delegates were arranged in seven groups of mixed nationality and mixed disciplines (educationists, architects, engineers, quantity surveyors, administrators and managers of school building investment) and four special topics were under discussion as follows:

Topic 1 : The Briefing and Design Stages	- Groups 1 and 2
Topic 2 : Providing for Future Change	- Groups 3 and 4
Topic 3 : Methods of Building	- Groups 5 and 6
Topic 4 : Research and Development	- Group 7

Preliminary papers had been prepared indicating the scope of each topic and raising key questions. The resulting discussions showed that they provided a more than adequate framework for the Symposium. Certain other main threads emerged in the group discussions which have been drawn together under additional main headings within this report. They refer to the whole theme of change in society which has implications for school building, to the social and economic pressures which affect it, and to the relationship desirable as between design teams and the teaching profession.

4. Members of the groups started from very different bases:

- differing administrative structures and practices within differing frameworks of local and national government;
- differing systems of education;
- differing attitudes of teachers towards their responsibilities, influenced by the degree to which they are constrained by legislation or regulation;
- differing teaching methods, differing attitudes towards children, differing views on the balance between freedom and direction;
- differing school objectives (multi-option may be ten choices in one person's mind and fifty in another);
- differing architectural practices and procedures;
- differing standards of building depending upon the amount and control of the resources available for school building;
- differing views about cost control.

5. Considerable time was spent in defining terms and positions before progress could be made. For example, what is meant by the term <u>educator</u> or <u>educationist</u>? In a small scale project it may be one person in whom educational responsibility is vested. In a large project it may be a collective term for a whole pyramid of advice and opinion channelled from

innovating teachers working in classrooms through heads of departments, school principals, inspectors and educational administrators. Architect is an equally loose term. It may refer strictly to the designer of a building. On the other hand, it may be a collective term for a professional/technical group of people including architects, structural and service engineers, landscape architects, furniture designers, quantity surveyors, systems analysts and the like. Imprecision in the use of other terms also proved an obstacle: brief and programme; function and activity; flexibility and adaptability; research and development; all these terms presented problems of definition and usage.

The Structure and Methods of Design Teams

6. All groups, but particularly those dealing with Topics 1 and 4, were concerned with the multiple aspects of school design and the diversity of skills it requires. Design is far from being a simple linear or consecutive process; it is multi-directional and interlocking and the whole process of translating complex social and educational objectives into efficient and smoothly operating schools is the outcome of a continuing dialogue between all the professional and technical experts concerned. In Part IV of his report on the Multi-Option School(1), Jean Ader discusses the constitution and responsibilities of the necessary "structures of dialogue", and refers to two types in particular:

(i) an empirical structure by the virtually spontaneous creation of ad hoc groups whose activity comes to an end with the completion of the project;

(ii) an institutional structure formed by setting-up permanently recognised bodies for the briefing and design of schools.

Both types of organisation are to be found in Member countries. The first is commonly associated with local and regional projects and the second with central government institutions established for research and development purposes. Difficulties of communication and interpretation arise among participants in the dialogue; architects then make quite arbitrary decisions through failure to analyse sufficiently the expected range and distribution of school activities. The question of where the responsibility for making such studies lies should either be more clearly defined or a particular methodology of educationist/architect collaboration worked out.

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(1) Jean Ader, Building Implications of the Multi-Option School, paragraphs 117, 129 and 130, OECD, Paris (to be published).

7. Groups 1 and 2, for example made it clear that a brief is much more than a schedule of accommodation, a list of specifications or a simple statement of user requirements. It is concerned with all the characteristics of the users and all the activities and events which will take place in the proposed building and its related facilities. The whole process of converting sets of activities into a working pattern of facilities is a complex one, and whether achieved empirically or analytically emerges from the to and fro of consultation and confrontation. The conclusions reached by Groups 1 and 2 are set out elsewhere, but it is clear that the analytical approach which they advocate requires a close identity of purpose between all the members of a design team. The question arose in Group 7 as to whether empirical observation and methods, however thorough, were enough or whether the time had not now arrived when a more scientific analysis of educational needs was warranted. This evoked the warning that excessive rationality could lead to dehumanised design solutions.

8. Greatest concern was expressed as to the adequacy of the educational voice within design groups. Too frequently, the voice is that of an educational administrator seeking the expedient solution which a community will readily accept. Architect delegates expressed their disillusionment with teachers whose experience has extended little beyond the conventional methods still so widely practised and who sometimes serve in a consultative capacity to design teams. Where are the teachers to be found who are not only aware of the changes taking place but are sufficiently articulate and critical to be of use in seeking new design solutions? There appeared to be two particular problems:

- firstly, that of identifying teachers already swept by the wind of change, who are themselves pressing hard at the frontiers of educitional practice, and mobilising them for work with design teams;
- secondly, that of communicating to the mass of the teaching profession information about innovative school buildings and the wider educational opportunities they afforded.

Could not education authorities provide the opportunity for more teachers to have some experience in new types of schools so as to become aware of their potential? Could not teacher-training institutions demonstrate to their students the variations in teaching practice possible in many of these schools? These and other questions are discussed in much greater detail in the last section of this report.

II. SCHOOL BUILDING AND CHANGE

Educational and Social Change

9. Birgit Rodhe, who gave an opening address, reminded the Symposium that change is only important insofar as it reflects a renewal of values. This differentiates it from change which is merely for the sake of change. The crucial questions are from where does it receive its momentum and what purpose does it serve? Advancing technology may advance the realisation of certain educational objectives and to that extent is valuable to society. But change and innovation should never be ends in themselves and should always be evaluated in terms of the social or educational objectives desired.

10. The need for constant evaluation and feedback became the concern of all the groups. But not all the qualities of a good life, and these are surely a major concern of education, are susceptible to objective assessment, and subjective judgments are frequently suspect. For example, some innovations in school building have initiated organic changes in secondary schools and have enabled young people to participate more effectively in all aspects of school life. The bonds of association and collaboration which resulted, provide a new momentum in education not readily quantifiable except insofar as the activities which they promote are a measure of their effectiveness. These are means and not ends however, and form an incomplete basis for assessment purposes.

11. Jean Ader(1) points out that the multi-option school is not a definitive type and must be apprehended and studied in the context of change. "In this sense it is a moment, a phase in a process of innovation." Its problems are problems of change, each innovation being a challenge to an earlier order of things. The Coventry comprehensive schools in England, planned in 1951-52 were multi-option in the wide opportunities they offered to pupils spanning the whole ability range, even though design tended to follow a traditional secondary school curriculum and conventional teaching methods. They were also a first step in securing equality of social opportunity for the pupils within the framework of a large state school. The Maiden Erlegh School(2), twenty years later (1971-72), is the most

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(1) Ader, op.cit., paragraphs 5, 6 and 7.

(2) Information Leaflet N° 2, "Maiden Erlegh, An English Secondary School Development Project" by Clive Booth, Programme on Educational Building, OECD, Paris, May 1973.

recent expression of the multi-option school and the culmination of an evolutionary process in which traditional ties which have bound the curriculum have been gradually loosened, methods of teaching have become much more varied, greater responsibilities have been assumed by individuals in the course of their own learning and human relationships within the school society have matured. Secondary education in England has been in a state of transition throughout the period and may continue to be so for a further twenty years. The processes of "de-schooling", the trend to pursue and expand education in places other than schools and to relate it more closely to work-a-day life, may in fact come to be seen, not as a revolutionary innovation but as the special effort of society to achieve its ever-growing educational aspirations in a period of relatively declining resources. The functioning of schools in detached premises, a considerable distance apart, the extension of school activities into unusual locations, the release of boys and girls into work experience as an integral part of their education, and study undertaken at home are all points of departure in these processes.

12. Educational change has to be related to the broader processes of social change in which it is embodied. Educational innovation is thus generated from many sources: changing public attitudes and values; policy reforms and economic stresses; the extension of knowledge into new areas; research and experiment and the development of new ideas; changes in the diffusion of knowledge and techniques. Though all countries find themselves in a state of social and educational transition they are often at different stages in a sequence of change and to that extent their immediate problems are different. Some are satisfied to proceed by evolutionary change, the pace of which varies from one country to another; others make big leaps ahead by means of legislation or statutory regulation. The wise injunction of Jean Ader(1) must here be noted: "... the multi-option school must not, by becoming frozen into a formula, counteract and sterilise the movement which gave it birth."

Technical Change

13. Groups 3 and 4 were compelled to face the problems of change head-on. They had to consider how buildings designed for today could be rendered adaptable to the educational demands of the future. They also had to ask themselves the more searching question of whether the benefits to

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(1) Ader, op.cit., paragraph 6.

be derived from an adaptable building by a future generation of users warranted the expenditure of additional capital now. Group 3 rejected this notion and saw "built-in flexibility", which permits of day-to-day adjustment of the furniture and facilities to new teaching demands, as the solution to evolutionary change. While not disagreeing with this view for those countries where flexible arrangements and informal teaching methods are already accepted, Group 4 stated that where more conventional methods of school organisation and teaching practice are still followed, the problem of possible major physical change to a building at some future date should be faced now. These are not so much differences of view as differences in points of departure arising from the different circumstances of the various countries represented.

14. Both groups recognised the flexibility which results from the location and integration of school facilities with housing and other public buildings such as libraries, museums and welfare centres; workshops of various kinds; shopping and commercial buildings; sports and recreation centres. School locations may therefore be very important to the greater flexibility of educational arrangements needed at some future date. Such concepts however demand a new mobility of thinking about "school" in which it is seen as an infinity of human activity and experience.

15. A common theme of change was that of advancing technology and how to exploit it more fully, firstly, in the processes of education itself and secondly, within the school building industry. The first is largely concerned with the fuller deployment of technological resources in the acquisition of knowledge, and disappointment was expressed at the slowness of education to grasp these opportunities. But this is only one aspect of changing practice among many. The majority of teachers consider it more important for pupils to have the opportunity to react to change, to explore it through the variety, quality and depth of experience which school and home life provide. While improvement in pupil/teacher ratios remains a desirable objective in most countries, a point of generosity could be reached which actually discouraged the use of technological aids. At the secondary level of education particularly, traditional teaching methods by oral exposition and cross-examination are still largely followed. This partly explains the time-lag between advancing technology and the ability and inclination of education to change with it.

16. The application of new technology within the school building industry sometimes gives rise to strong differences of view, particularly in matters concerned with the physical environment. The technology of the "interior climate" is now taking school design in two quite different

directions. At one extreme is a mechanical concept of flexibility within a controlled environment. This is expressed in the form of an extensive, deep, single-storey building of uniform ceiling height, carpeted throughout, air-conditioned, artificially lit to a high level of intensity and equipped with relocatable furniture and screens. Critics of this find its sheer monotony dulling to the senses. Opposed to this is the concept of a total learning environment providing a variety of surroundings for the children with small and large spaces, high and low ceilings, strong lights and shadows, changing light, long and short views, rough and smooth textures, hard and soft materials with inside activities spilling outside and vice versa. The main criticism of this approach is that the building is overcommitted to particular activities at the outset and, to this extent, its flexibility in use is diminished. These opposing views were both implied and expressed in discussions about briefing and design and adaptability and flexibility, and Group 3 firmly rejected the first approach and favoured the built-in flexibility which the second offered. Humanists and environmentalists as well as teachers will no doubt enter the controversy as such buildings are evaluated by their users, and thus determine the degree to which such control is in the best interests of education. Cost considerations too will no doubt influence decisions.

III. SOCIAL AND ECONOMIC PRESSURES

Social Demand

17. Education is now increasingly regarded as a life-long process, to be taken up by an individual as and when needed. Such a concept, which must necessarily cover a very wide range of educational facilities, is scarcely attainable within the present framework of our public institutions. Educational systems already operate within exacting financial constraints and to meet the social demand for still more education, administrators, financial officers and planners must extract the last drop of educational benefit from every available financial resource. These demands and constraints frequently intruded into the discussions. It became clear that in some countries the need to increase the range of educational opportunity for everybody extended far beyond the provision of a multi-option school building, available exclusively to a school community. In the design of buildings for total community use, and therefore available to many different groups, shared or overlapping use is central to their planning. Within the total design, each group surrenders some of its independence

to common interests and advantages. The objective of greater social and educational opportunity for all, within tightening financial limits, may only be possible in these terms. PEB is already turning its attention to this wider field of educational building and will do so increasingly as "more for less" is demanded of governments in Member countries.

Cost Control

18. Rigid cost controls also came in for some criticism, especially by architects who saw them as stifling to innovation. This may well be so in those countries where mandatory building regulations define precisely the number and area of the functional spaces required, and leave the architect with little scope for experiment within the limits of cost imposed. Mandatory space prescription combined with tight cost control can certainly cripple design initiative. But cost control is an attempt to allocate financial resources for education building equally and fairly and may operate at national and regional levels. It emerged from discussions however that in some countries there are rich and poor local education authorities and consequential differences in financial allocations and standards of building from one to another.

19. In some countries, long experience of development work in which the results of research and the experience gained in the critical examination of educational practice are applied in actual projects, suggests that a respect for cost limits makes innovation more credible and more acceptable to policy-makers, and that cost excesses may, in fact, deter school building authorities from adopting certain innovatory features, however necessary they may be. Agreed costs, whatever their basis, represent the balance struck as between educational needs and available resources. There is insufficient evidence to prove that greater innovation takes place in countries where additional cost is allowed for this purpose than in countries where strict control applies to all school building. Though cost limits in school building may constrain design, they are euqally an incentive to the more effective use of space and facilities, particularly where architects are free to exploit alternative space solutions in the disposition of activities. A timely warning on the strict application of cost limits is however necessary. During periods of inflation they need frequent adjustment in order to maintain space and environmental standards at an acceptable educational level.

20. More complex cost considerations are now emerging which require systematic study. In its discussions about flexibility and adaptability, Group 4 emphasised the need to consider the total cost equation when

assessing the benefits to be achieved; site acquisition and development, building and services, running and maintenance costs, furniture and equipment are all elements which need to be balanced one against the other. Less building, more furniture: less teaching staff, more technical aids to teaching: greater social facility, less for direct teaching purposes - these are all mutable elements within a total design and inevitably linked in their cost consequences. In terms of the social and educational demands now being made, school building costs will need to be considered within the broader context of a total education service in which all groups share the facilities provided according to their needs. New techniques of cost budgeting will no doubt develop in which the value to be placed on social benefit to the community of any particular facility will assume great significance.

Statutory Building Regulations

21. Groups 1 and 2 particularly, and other groups generally, commented on the unduly restrictive nature of statutory building regulations during a period of rapid change. School building design teams operate within three areas of decision as follows:

(i) a set of building regulations which are mandatory; this is the area of decisions already made, but which serve to solve in advance some of the design problems;

(ii) a body of advice given by central, regional or local authorities, comprising reports on development projects, manuals of guidance on particular aspects of design or plans of new schools of special interest; designers are free to adopt or reject such advice, but are generally expected to consider it;

(iii) an area of freedom to design a school which meets the special needs of the neighbourhood it is to serve.

Norms can be defined very generally as regulations and/or guidelines about the standards which it is intended school building should meet. Such norms are necessary to ensure a well-constructed building offering comfortable physical conditions and safety to its users. Some school building regulations are based on assumptions that teaching organisation and method will conform to specific patterns, and unless they are revised when patterns change, will paralyse the processes of evolutionary change in school design. In recent years, design solutions to meet new educational demands have evolved much faster than the revision of norms required to meet them. Unless schools are to be out-of-date by the time they leave

the drawing board, then statutory building regulations should be so framed that architects are free to adopt new design solutions whenever particular educational circumstances demand it.

22. Some countries allow exceptions to their norms for development projects exploring innovatory features. Others have been able to reduce statutory regulations to a minimum and to rely on an increased body of advice both to maintain standards and to provide guidance on new problems. These attitudes to school building were welcomed by architects as creating the climate and mobility of thought essential to the emergence of new design ideas. Some of them observed that advice from central authority is too often interpreted as mandatory, while others considered it a matter of accepting it in principle but not necessarily in detail. The general conclusion expressed was that within the overall areas of mandatory building regulations, design advice and freedom to develop new ideas, the proportion of freedom should continue to increase.

IV. BRIEFING AND DESIGN

The Briefing Process

23. The groups agreed that the briefing process is the whole flow of consultation and decision-making between establishing the need to build a school and its ultimate occupation. The record of the understandings reached during the course of this dialogue is, in fact, the brief. The process may be broken down into a series of operations which constitute a simple briefing and design model, namely:

(i) defining objectives;

(ii) formulating policies and considering the whole field of constraints;

(iii) drawing up the programme(1);

(iv) planning the building;

(v) building and equipping the school;

(vi) occupying the building.

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(1) Although the programme may finally emerge as a list of the accommodation and facilities required, and their relation to each other, it is reached through an analysis of all the characteristics and activities of the users (see paragraphs 27 and 28). Such an analysis is essential to the programming processes.

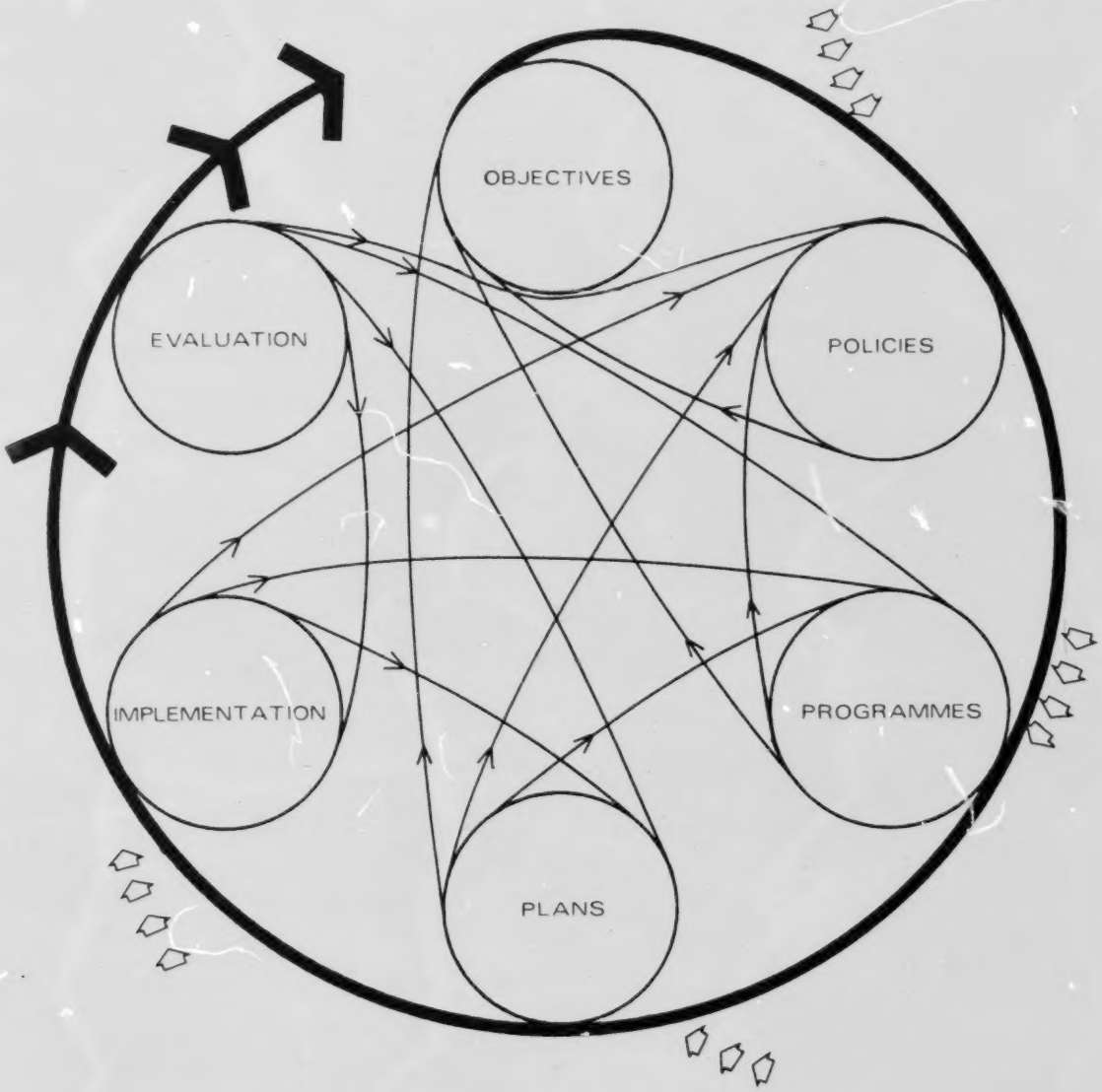

Figure 1 : The briefing and design process

24. Jean Ader(1) has pointed out that it is too common an illusion that one can pass from educational concepts to the definition of projects which give them life by a simple process of deduction. The groups made it quite clear that the above operations are not to be seen as a straight sequence of events (see Figure 1). For example, new decisions at, say, the

(1) Ader, op.cit., paragraph 10.

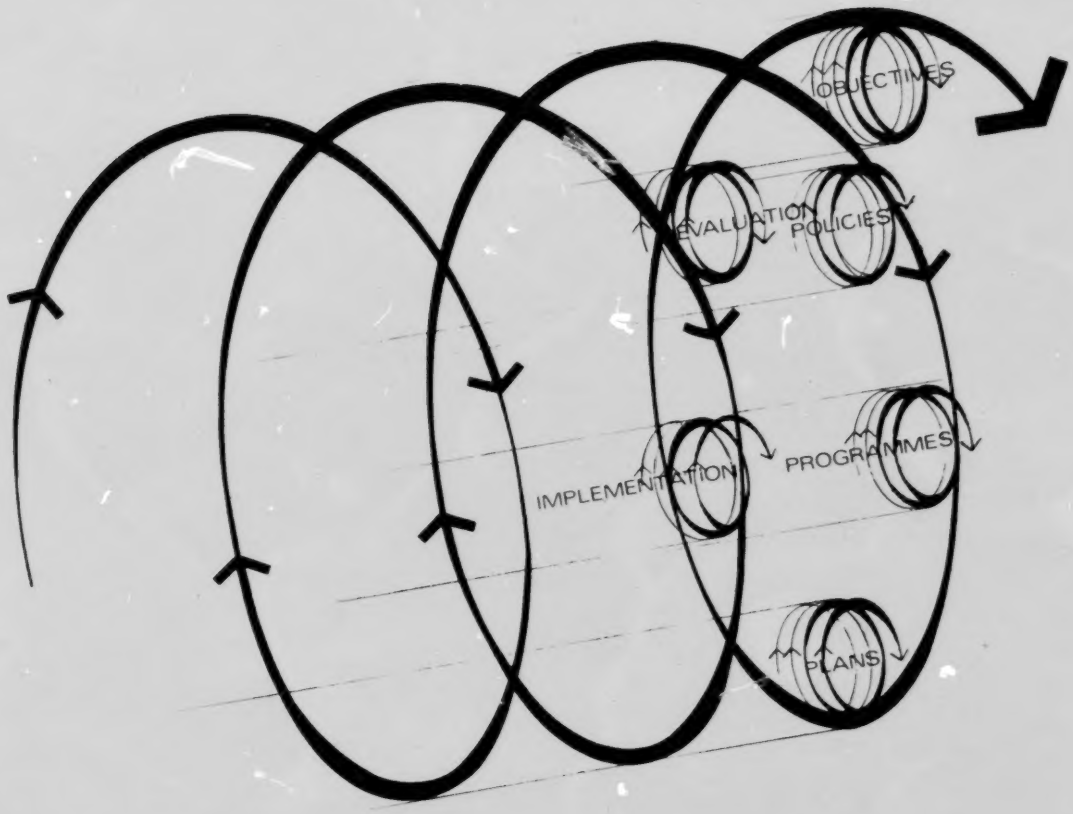

Figure 2 : Briefing and design as a continuous process

programming stage may necessitate reference backward to previous decisions and some reconsideration of policies and objectives. The whole process must be seen in a time-scale and the sequence of events is best expressed in spiral form (see Figure 2). Evaluation takes place after a period of time which, in this spiral of events, is fed into succeeding projects to their great benefit. This dispels the notion that a brief is some kind of educational concept or model drawn up at an early stage, and that

design is the expression of this in plan form at a succeeding stage. In fact, these are not seen as separate stages but as continuously interlocking processes and events throughout the whole course of decision-making.

25. There were differences of view regarding the nature of a brief, the functions of the collaborators within a design team and their levels of intervention. They arose, in the first place, through differences of practice in the various countries represented. Elaborate school building norms, which often specify the number, size, and function of spaces for a school of given size, still operate in some countries and predetermine the major educational requirements and strongly influence the design solution. They restrict variation and greatly reduce the effectiveness of the educator/architect dialogue. Nevertheless, such norms reflect present school organisation and teaching practice within educational systems as they now exist. Misunderstanding also arose as to the level of intervention and the purpose of the briefing and design operation under discussion. While the majority saw it at a national or regional level of investigation, research and development (on the lines of the SAMSKAP or SEF systems), a minority saw it at the local level of the actual users, where the consequences of innovation would be directly felt. There is clearly a difference in the structures of dialogue as between the research and development project in which each design item comes under close scrutiny and, say, an urban school in a pressing production programme, in which designers will rely greatly upon their previous experience and any recently published advice which might be to hand.

26. Some delegates saw a simple brief at two levels of data and decision-making:

(i) a general section covering basic decisions as to the type of school, its size, cost and location, the statutory requirements of the authorities concerned and any other constraints affecting the project;

(ii) a special section, largely the concern of the local authority and the client, covering the detailed requirements of the users; this includes the determination of any special functional spaces required and their relation to each other, and a full consideration of the furniture and equipment needed for the life and work of the school.

Here again there was considerable difference of view between those who regarded the definition of space by function as the basis for design and those who approached it through an analysis of observable and foreseeable

activities. In the past, the starting points for briefing have been the conventional organisation of a school into fixed class groups and special subject departments, each having its own territory and facilities appropriate to its work. Hence, space has tended to be defined quite arbitrarily according to its subject function and thus, science laboratories, workshops, home economics rooms, geography rooms, needlework rooms and other spaces have become fixed images. They actually resist any break in the pattern of activities which have become habitual to them. A more dynamic approach to design problems is imperative if school building is to adapt itself more readily to demands for greater variety of opportunity within the educational scene.

Activities as a Basis for Programming(1)

27. Groups 1 and 2 emphasised that a brief is concerned with all the characteristics of the users, including their social and cultural background, and all the activities and events which will take place in the proposed building and its related facilities. The idea of activity seems more pertinent than any other in accounting for the whole wealth of opportunity and organisational complexity of the school of today. For these reasons, the groups did not favour the competition approach to school building because it tended to restrict the dialogue between participants and narrow the field of investigation and analysis.

28. In order to develop a methodology of briefing, the groups considered carefully the report on Activity 2, especially those sections dealing with the dimensions of activities(2). They agreed that activities are not defined solely by their physical manifestations but are modified by the interactions of all the users. Activities emerge, as people interact with each other (teachers, pupils, counsellors, technicians, helpers, cleaners, cooks) and as people interact with materials, equipment and other features within the total school environment. An example of this approach is illustrated in Figure 3. Programming therefore proceeds through the following stages:

(i) listing and quantifying the activities which emerge from the interaction of people, materials and equipment; these activities are not confined to learning processes only but encompass

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(1) Substitute the word "briefing" for "programming" depending upon own particular usage of these words.

(2) Ader, op.cit., paragraph 80 et seq.

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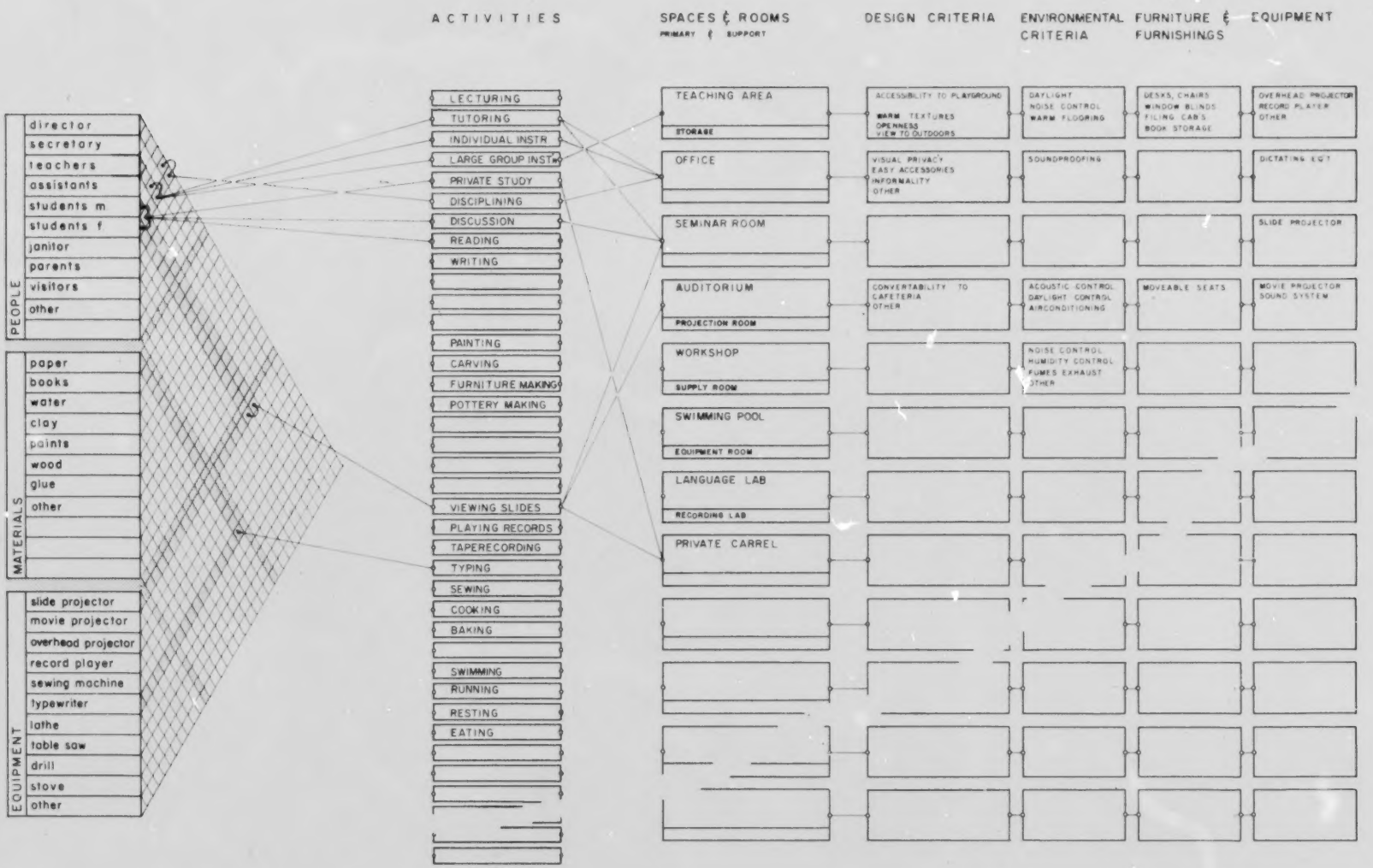
Figure 3 : Drawing up the programme



social and cultural interactions and all the technical, administrative and even commercial arrangements necessary to a school;

(ii) identifying the types of spaces (open work areas, individual work stations, closed teaching rooms, social spaces) in which these activities are best accommodated;

(iii) determining the design criteria for such spaces (relations with other spaces, accessibility and spatial environmental requirements such as heating, cooling, ventilation, lighting and acoustics);

(iv) accommodating the furniture, equipment and materials already identified in the analysis of activities.

These stages are not entirely sequential. The necessity to accommodate certain items of furniture and equipment in a space is one of the design criteria for that space. Discussion of a brief if also multi-directional; the architect may brief the educator as to the choices open to him, and the administrator may caution both as to the policy consequences of their decisions. Hence, success often rests on the personal understanding reached between collaborators, and compromise is inevitable.

29. The report, the Building Implications of the Multi-Option School, attempts to analyse what is included under the generic term activities. It sees them expressed in three dimensions:

- firstly, those which are observable in the real life of schools, those which are desirable and which emerge from the educational concept of the school and those which are possible because they are dictated by the facilities available to carry them out;
- secondly, the characteristics of activities as expressed in terms of behaviour;
- and thirdly, fields of activities; activity studies have often been limited to those induced by the curriculum, whereas account must also be taken of those emerging in the social life and leisure of all the people in a school.

Such an analysis points to the need for a "typology of foreseeable activities". This would probably take the form of an ordered description of activities compiled through a study of the daily life of a school. It is in the light of these activities that teachers, in dialogue with briefmakers, can indicate what facilities, equipment and materials are needed to further their objectives. This points to an interesting line of research which still remains to be explored.

30. Some delegates regarded this approach as one requiring long and continuous study and there were some misgivings as to the capability of all countries to undertake it. Effective briefing and design demands a continuity and intensity of observation and analysis which is inconsistent with the generally short interval between the decision to build a school and its necessary implementation. It is clear that normal school building procurement must lean heavily upon research and development and the cumulative experience of central and regional agencies. Indeed, one group observed that a particular school brief can only take into account the total interaction of teachers, pupils, space facilities and materials if there is an advisory research service at the elbow of the brief-makers. The building of a new school is an important event in the life and history of many communities and the involvement of local people within the framework of a design team is essential, particularly as other public institutions may well share in the use of school buildings. The cultivation of informed local opinion then becomes of major importance, and central and regional authorities should consider how this can be achieved.

31. Though not accepting wholly the methodology outlined above as being immediately applicable within their own countries, some delegates saw the attainment of similar objectives through a number of interim stages. There is wisdom in this, especially in those countries where teaching practices are slow to change and where design innovation must carry teacher opinion with it. Teachers may be persuaded, for instance, that teaching space needs only partial definition by subject and function; that learning activities are many and varied and that a similar variety is common to many subjects of the school curriculum; that a set of related activities may apply to an integration of subjects designed for the pursuit of a new branch of knowledge; that sets of facilities designed for such activities are frequently interchangeable and therefore adaptable in use. Thus, space is eventually defined by activity. More teachers are growing to appreciate the wholeness of knowledge and experience and are now trying to combine what were once considered as disparate subjects into a total enterprise more relevant to the education of many of their pupils. In such circumstances, the facility to modify and interchange workplaces is a potent instrument in the hands of imaginative teachers.

32. One final recommendation of Groups 1 and 2 is important to record. They suggested that further study should be made of the social interactions of children with their environment as one of the bases for briefing. Environmental conditions, in their broadest sense, influence the quality of relationships as between people. The vitality of the response of

children to a teacher is the product of his own personal gifts and the stimulus he and others have created within the learning environment in which he functions. Social life is not something which can be imposed on a school by a particular set of facilities. It emerges through the relationships established in learning activities as well as in the informal associations which are usually termed as the social life of a school; through the appreciation and understanding reached in the give and take of discussions during a seminar or in a tutorial session, the respect and admiration of skills in each other and shared experiences in group projects. The environment can "warm" or "cool" the interactions of teachers and children and to that extent is a major factor in teacher effectiveness. It is now an educational axiom that the whole environment, natural and man-made, educates, and that we need to create in new schools the conditions which arouse the greatest possible response in the children. Designers, guided by the activities and aspirations of all the people within a school community, might then organise the spatial implications of their study in a way that has no formal precedent in terms of either education or architecture.

V. PROVIDING FOR FUTURE CHANGE

Degress of Physical Change in a Building

33. The notion of school building to meet future change presents a number of paradoxes, not the least of which is the concept of a society without formalised schools in which the location, nature, status and modes of education have changed radically. Though this is an abstract idea as yet, the recent course of evolution of educational and social institutions indicates that they are becoming less definitive in their functions. In the process of balancing social demand with available resources, schools are being compelled to become less exclusive in their use of facilities, as are other types of public institutions (e.g. libraries, community and welfare centres, youth and recreation centres). Nevertheless, whatever the future of public institutions, it is probable that there will always be a need for premises given over to educational communities for teaching and training in the widest sense, and to that extent there will always be "school building". In present circumstances, new school accommodation must be adaptable to future change, and must favour innovation in use of varying magnitude, ranging from a simple modification of facilities to substantial physical change in the building.

34. There is a universal cry for school buildings to be flexible and adaptable and Groups 3 and 4 were asked to examine and define these qualities in a building and to suggest how they might be secured in the interests of future change. A preparatory paper drawn up for the guidance of delegates set out the following definitions:

(i) change which is of high magnitude and for that reason unlikely to be frequent will probably require extension or change to the fabric and services of the original building, in short, adaptation;

(ii) adaptability is the quality of a building which facilitates adaptation: adaptation may require relocation, replacement, removal or addition in respect of either the constructional elements or services of the building;

(iii) flexibility may be defined as the quality of a building which permits variation in the activities, time-tabling and class sizes of a school without need for adaptation as defined.

The paper then continued to develop concepts of flexibility and adaptability as points of departure for the discussions.

35. The two groups approached their subject from quite different viewpoints and it is interesting to reflect upon the reasons for this. Group 3 placed far greater reliance on human flexibility to accommodate future change and far less on ingenious technical modifications to a built enclosure. Moreover, it emphasised that whatever the recommendations made on designing for future change, architects must satisfy the educational needs of the present and foreseeable future as fully as possible. As one delegate put it, "we should not sell the present short for the sake of an uncertain future". Group 4 saw educational practice as firmly rooted in its traditions, with teachers slow to emerge from the security of their known professional practices. A similar divergence of view was at the root of the differing attitudes to briefing and design in Groups 1 and 2 as between those who sought a solution through an analysis of activities in school life and those who favoured a simpler approach expressed in terms of spatial function. The different points of departure resulted in different solutions to the problems posed. Those with an open view of education, who conceived of teaching as the organisation of the many and varied processes of learning in which pupils play an active role, found a solution in flexible arrangements offering the possibilities of day-to-day change. Others appeared to be concerned with designing for class teaching as the most efficient way of transmitting knowledge and skill, and sought a solution in terms of a building physically adaptable to changing class sizes

and space function. Both are relevant to the current problems of Member countries with their markedly different educational systems, institutional arrangements and teaching practices.

The Concept of Flexibility

36. Flexibility in a building reflects the flexibility of the activities pursued within it. It therefore results from a concept of total school activity held at a particular point in time. It is a means of assisting the variation and extension of such activity insofar as its present state is known and its foreseeable evolution is understood. Flexibility is, in fact, the possibility of day-to-day change in the use of a building and the facilities it offers - it is variation without physical change.

Designing for Flexibility

37. Group 3 approached the subject of flexibility through the problems of designing a flexible multi-option school. While it did not discuss "de-schooling" as such, the group recognised the flexibility which resulted from the location and integration of school facilities with housing, other public buildings, and commercial and business premises. School location may therefore be very important to the greater flexibility of educational arrangements needed at some future date. The Group also discussed the qualities of built-in flexibility which permits of day-to-day change in the teaching programme, in the variety and type of learning activities, in the size of working groups and in the social mix of the pupils. In its view, built-in flexibility offers greater educational benefit than that which derives from moveable walls and which has only limited application. Such a building can also be used more intensively than a conventional one, and is not likely to become obsolete so soon.

38. The undifferentiated open plan - a space in which everything is possible and nothing is predetermined - was rejected as a valid concept. Superficially, it has many attractive features in simplifying the brief, securing economies in running and maintenance costs and in achieving long-term savings in the capital cost of physical alterations to meet educational change. Its critics consider the space per pupil required and the quality of the environmental control necessary to its success as too costly. Where economic resources permit a generous provision of space to overcome many of the acoustic and environmental problems, the undifferentiated space can offer great freedom in design and use. But where cost, and therefore space, is restricted, the standard of the uniform physical environment which results is often too crude to provide the acoustic

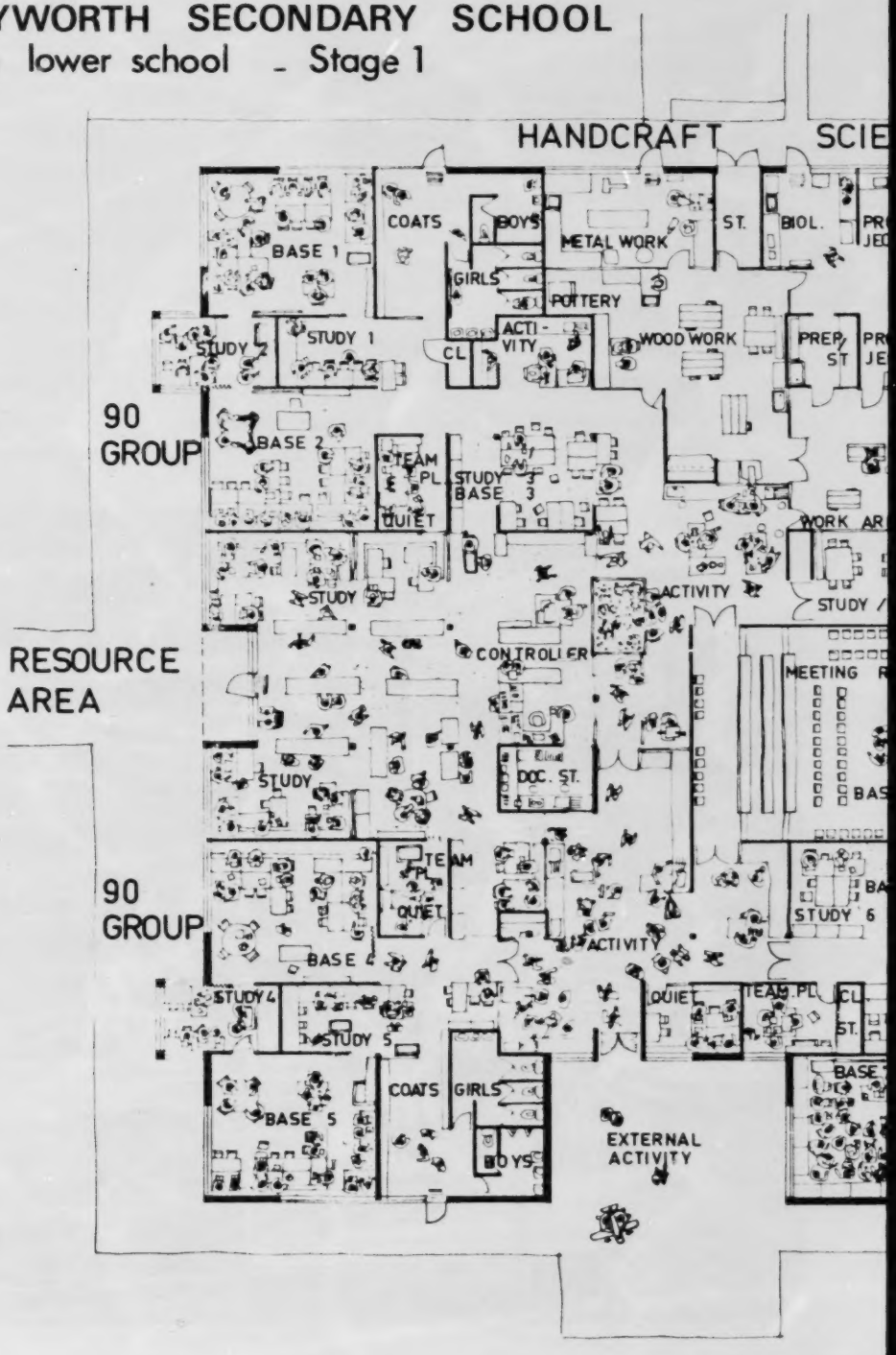
privacy necessary to some branches of teaching and too sophisticated for others.

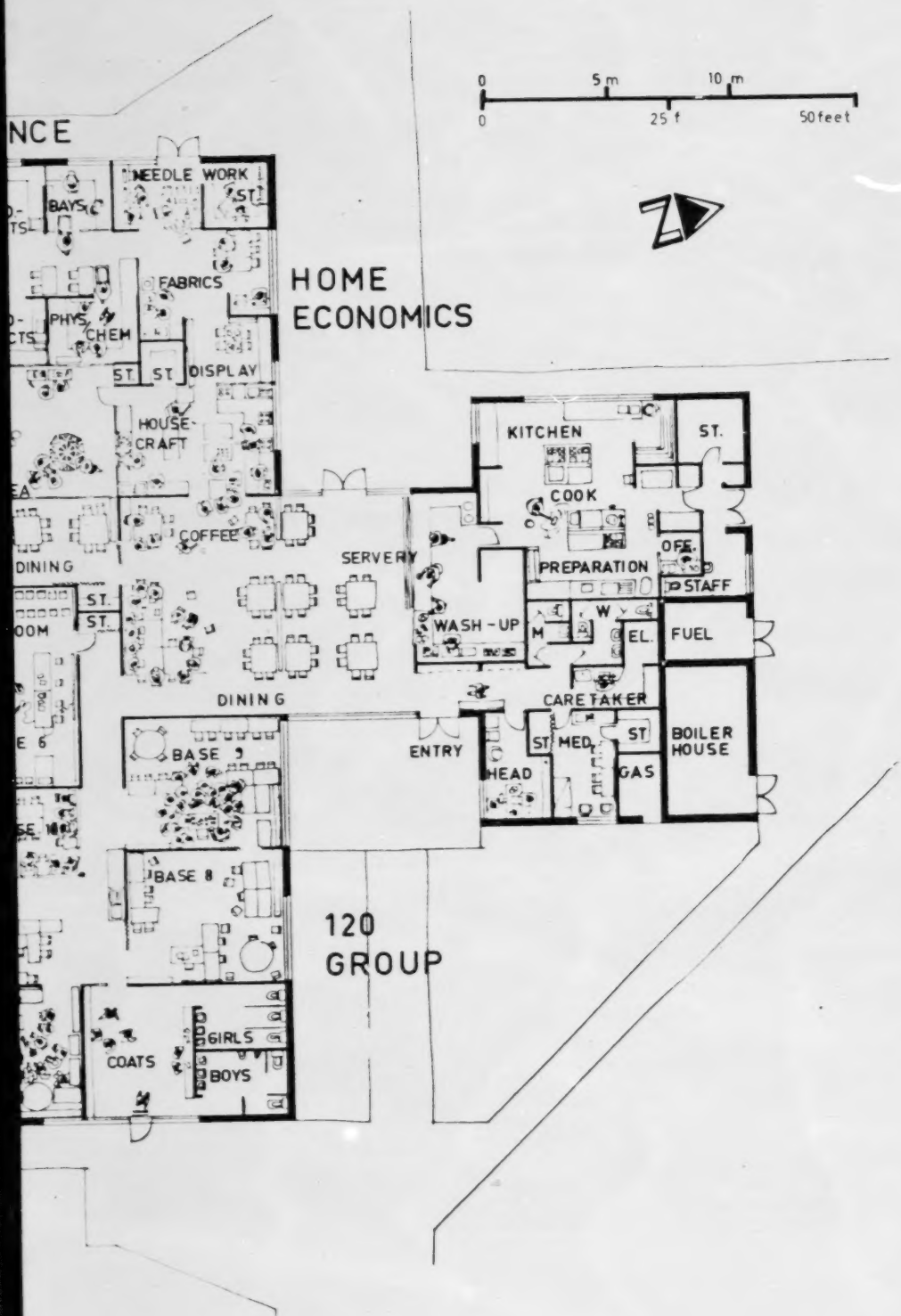
39. Group 3 advocated the large generalised teaching area, punctuated or articulated by specialist spaces, as offering the widest opportunities for flexibility in use. Separate specialist blocks of teaching accommodation were rejected as inflexible features of school design tending to restrict the development of "across-the-board" curriculum studies. The dispersal of at least some special facilities in blocks of accommodation provided for more general learning activities enables teachers to operate courses of integrated studies on informal lines within their own buildings. This tends to extend the range and frequency of multi-choice possibilities within the school programme.

40. The limits to flexibility in open planning are defined in part by the occurrence of such physical problems as noise, dirt, fumes, health and hygiene and safety. The privacy required for tutoring, counselling and study; the need for quiet teaching, free from the distractions which may impair the quality of the work; the special physical arrangements required for language learning and for engaging in music and drama - these are all limits to the flexible use of space. So are the requirements for workshops, gymnasia and sports halls. Care must be taken not to overstate these limits, however, or to regard them as fixed and unchanging. Young people of today are more tolerant of intrusion than their predecessors, and human habits change. In schools where the emphasis is on self-instruction, there is often a large generality of space for a mixture of learning activities, some practical and some bookish, in which boys and girls participate against a broadly acceptable background of noise. Attention must be paid to all the problems posed however if flexibility is not to degenerate into forms of undifferentiated open planning which is inefficient on many counts.

41. Visits to some English schools stimulated discussion on the subject of flexibility (see Figure 4). The freedom to circulate without there being a special function of circulation independent of teaching functions; intercommunicating spaces and teaching bays for a variety of activity and group size; space arranged in "families" of activities and used flexibly - these and other features brought comment from visitors. Flexibility in use appeared to have been achieved by a combination of two factors: a continuum of space and well designed furniture and storage units. Both groups agreed that a well designed system of mobile furniture and storage units is essential to flexibility in use, allowing

Figure 4
KEYWORTH SECONDARY SCHOOL
The lower school - Stage 1

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ST
WASH-UP
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EL.
FUEL
DINING
CARETAKER
BASE 9
ENTRY
ST
MED.
ST
BOILER
HOUSE
HEAD
GAS
BASE 8
120
GROUP
COATS
GIRLS
BOYS

teachers and pupils to re-arrange their accommodation whenever the need arises (see Figure 5).

42. Though reference was made incidentally to the use of audio-visual and other technical aids in education, there was little serious discussion as to the effects of their requirements on the flexible use of space. It seemed to be accepted that a language-teaching laboratory, for instance, was at the limits of flexibility because of the physical problems it poses. This again raises the question of space specialisation. If a space is required to be devoted permanently to the use of one type of technical aid, whether it be as a projection room or as a language laboratory, it will inevitably dictate group size in relation to a particular teaching function and will therefore be a rigid feature within the school time-table. As a result of the demand for greater flexibility in the use of space, forms of equipment are now emerging which are portable and

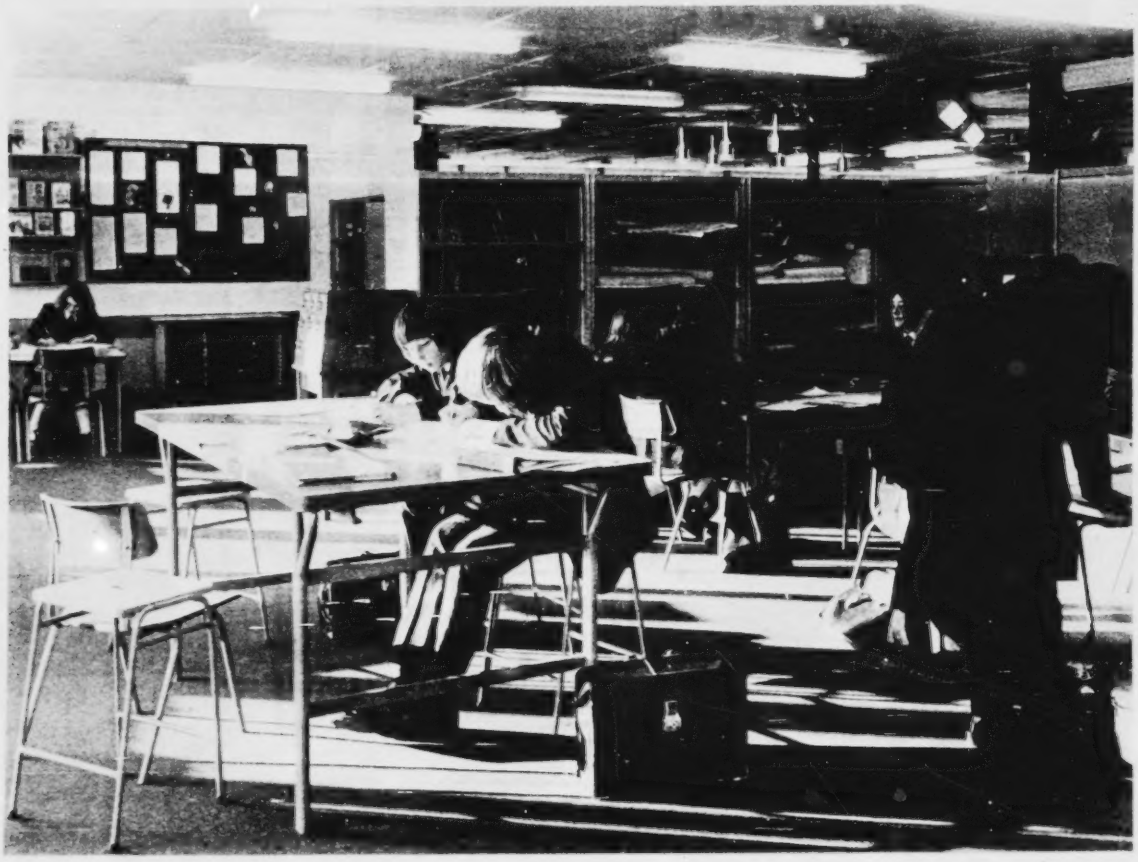

Figure 5 : An example of mobile furniture and storage units seen as being essential to flexibility in use.

adaptable to different circumstances. Development is now directed towards minimising the degree to which a building needs to be designed or adapted to the requirements of a particular piece of equipment and to maximise its flexibility in use for teaching purposes. Informal curtaining, daylight projection, re-chargeable power packs, simple and cheap recording facilities and transistorised television monitors are all helping to break the stranglehold of the fixed conditions in which some technical aids have operated in the past. Audio-visual equipment is becoming smaller, lighter, more robust, simple in operation and relatively cheap. As it becomes less dependent on the building and on building services, so it can be brought to the aid of the individual learner whenever and wherever the teaching demands its use.

43. In assessing the total cost of flexibility, the total cost equation covering buildings, furniture and equipment should be established. Any extra cost of mobile furniture and storage units should, for instance, be offset by savings in building costs. Examined in these terms, flexibility in use should be achieved without extra cost. Group 3 expressed the view that, provided flexibility is regarded as a design objective from the outset, then the sort of building described above with its qualities of built-in flexibility is not likely to cost more than a conventional one.

44. Space is undoubtedly an important factor in permitting the flexible arrangement of learning facilities. Participating countries differed greatly in the areas per pupil provided, some standards appearing so low as to leave little margin for flexibility in use. Some Member countries are still faced with the problem of securing essential primary education for all their children and the financial resources available often provide only a bare minimum of facilities. It may be argued that in these circumstances the greatest possible flexibility in the use of space is required and that this presents a crucial test for designers. Is the bare minimum of facility to be interpreted as the maximum number of workplaces for a passive type of learning because these are less space-consuming? Workplaces which enable a pupil to play a more active and more varied role in his education tend to be omitted because they demand a little more space. Nevertheless, these children are subject to many of the pressures of change now current and need to be adaptable to them. It was recommended that PEB should undertake a comparative study of areas, costs and physical standards in Member countries. The problem of designing more flexible arrangements of learning facilities where unit areas are particularly low also merits special study.

Flexibility and Safety

45. The groups were seriously concerned at the increased risk from fire, and from the effects of toxic smoke and fumes, in deep, open-plan buildings. Such risks are increased where storage space dividers are rearranged to create rooms within rooms, thus producing maze conditions, and where windows cannot be opened to allow escape. In such circumstances pupils should familiarise themselves with new arrangements of furniture and escape routes should be clearly marked. It is important that these problems should be faced by users as well as designers.

Adaptability in a Building

46. The schools we build today will be used, not only by our own children but by their children also. This was not a daunting prospect to designers twenty or thirty years ago when social attitudes and ideas about education were slow to change. But today, architects may be called upon to design buildings not to any one particular concept of teaching organisation and methods but adaptable to many. The "close-fit" theory of design - the concept of building to meet the exact needs of the moment - is consistent only with progressively shorter life buildings as the pace of change gathers momentum. Present economic circumstances, combined with increasing social demands, appear to call for long-lasting buildings designed for economy in use and adaptable to future needs without rebuilding. A tailor-made fit is incompatible with longer life buildings in which a maximum of flexibility in use now must be combined with a minimum need for replacement or adaptation in the future. In the to and fro of discussion on the subject of adaptability, these were the kinds of issues raised by Groups 3 and 4. Small wonder, therefore, that diverse conclusions were reached.

47. This diversity arose through the varying character of the situations to be faced in the various countries. The report on Activity 2 stated that "the multi-option school is an expression of the search by the democratic industrialised societies for a system of secondary education in which everyone has an equal chance and the potentialities of each individual can develop to their fullest"(1). In their evolution towards this, countries have different points of departure. At one extreme are those countries which see a school building as a neutral setting for teachers

(1) Ader, op.cit., paragraph 113.

using traditional class-teaching methods. At the other extreme are those countries which see the building and its equipment as an instrument essential to the development of the educational processes themselves, to be used jointly by pupils and teachers in the pursuit of learning. These are widely differing points of departure towards similar objectives in the achievement of which one may demand much greater physical change to a building than the other. Reference has already been made to the degree of "necessary indetermination" now required in any school building design to allow for choice within a changing range of educational opportunities and the development of innovatory teaching practices. In this context however, the need for qualities of flexibility and adaptability in a building should not become an excuse for indecision in design. They should be design objectives from the outset and interpreted positively.

48. Group 3 saw the quality of adaptability expressed in two forms:

(i) internal adaptability by means of relocatable partitions and extendable services and by the use of an open-frame system for constructing the building; the frame need not allow for enormous spans since columns at close centres have not been found to limit flexible planning in practice, and big spans tend to cost big money;

(ii) external adaptability which allows for future building extensions; advantage was seen in dispersing facilities to enable small teams of teachers to have a measure of control within their own buildings, but only where units are large enough to offer multi-choice activities.

The group concluded that school plans should try to allow for future physical change both internally and externally, but not to the extent of spending more money initially.

49. Group 4 concentrated its discussion on the qualities of adaptability desirable in a school building and came to a quite contrary conclusion. Adaptability was seen as a quality which you either buy, consciously, or refuse to consider. Unlike flexibility which has an immediate purpose in matters of day-to-day change, adaptability is concerned with major functional change at some future date. The search for certain adaptability leads to certain excess cost. The Group qualified these views however by adding that internal physical change to a building did not present such acute problems in those countries where flexible teaching arrangements had already been accepted, and buildings had been planned to facilitate them. But for those countries where conventional educational practices are still largely followed, the problems of physical change to meet new demands are

much more significant and pressing. There were two clear approaches to planning:

(i) to refuse at the briefing and design stages to pay any attention to the idea of adaptability and thus to spend on today's needs, letting the future take care of itself; one solution would be to build schools of limited lifespan and eventually to rebuild rather than adapt them; this was an investment in obsolescence however and placed a heavy financial burden on the future;

(ii) to consider a school building which will eventually function in a way not yet understood, and which may have to be adapted a number of times during its lifespan and then to take positive action in the matter of such adaptations through systematic cost studies made over a number of years; adaptability might then be bought by such excess cost as policy-makers deemed to be warranted; alternatively, it could be bought by economies in the building (e.g. reducing floor area or postponing certain finishes) which then pay for its adaptable features; in this latter case the present generation of pupils and teachers pay the price for the future by accepting reduced standards now.

50. The Group thought that in the search for adaptability, sophisticated solutions with a high initial cost should not be considered. Design effort should be concentrated on the structure and services and have the following objectives:

- to build with frame construction rather than load-bearing walls;
- to provide a uniform loading capacity on each floor;
- to be able to add, take away or replace internal partitions - or to demolish them and rebuild elsewhere - without necessitating expensive modification to the services (water, drainage, electricity, heating, ventilation);
- as far as possible, to dispose these services independently of internal partitions;
- to determine the areas of the building to be used for technical and scientific work and to size pipes, ducts and wires without parsimony so as to allow the facilities to be extended;
- to position the fixed points of the building with a maximum of discernment e.g. staircases, mechanical services and sanitary installations;
- to so dimension the buildings that complex problems of natural lighting and ventilation are avoided.

51. In its preliminary note to the Symposium, the Secretariat said of this topic, "the central problem is then how to allow for future change and variation while at the same time giving the variety and vitality needed now to match the best in modern learning methods". This is one of the most crucial issues school building faces and one on which continued discussion and investigation is required. It needs to be studied in parallel with the analysis of school activities suggested by Groups 1 and 2 as a basis for briefing and design. The qualities of flexibility and adaptability desired should then evolve as the need to interchange activities, or vary sets of activities, is met in workable design solutions. But the problem extends even beyond this concept, for as schools are increasingly regarded as resources to serve the whole community, and therefore available to various educational and social groups for their own particular purposes, then the problems of designing for change become still more complex. Events have a habit of overtaking our search for solutions so that perhaps we should examine our points of departure more carefully. Schools might be more ready to change their habits were we first of all to design places where people have access to cultural and recreational opportunities, and then allow the education of young people to develop in them.

VI. METHODS OF BUILDING

The Need to Adopt New Building Methods

52. During the last twenty years or so, a growing proportion of school building has been carried out by unconventional methods of construction and procurement. It is interesting to reflect that twenty-five years ago, prefabrication was seen as a temporary expedient, a way out of a difficulty. Today it has bloomed into a major architectural and business activity which the profession and industry now take seriously. The implications of industrialisation for school building, whatever form it may take, are exceedingly complicated and the whole process of designing and producing a standard system is technically absorbing and fascinating. Benefits in both time of construction and cost are claimed from the use of these methods and they have been particularly consistent in their results. But unless they can offer variety of learning and social facility and a high quality in the environment created, no significant educational advance will have resulted from their use. This is the acid test. Countries also vary in their educational circumstances and these change, sometimes rapidly. Standard systems will therefore be judged by their ability to change as new demands are made on them.

53. Just as educational processes are evolving from day to day, so standard systems must evolve to match these changes. This assumes a continuous process of development within a standard system so that it can respond to a variety of demands. Group 7, for example, expressed the view that the problems of producing buildings in large quantities have either been resolved or are less urgent and that the most pressing issues today are those concerned with the quality of school building. This is probably the case in the most highly industrialised countries, though there are others where the sheer demand for new school places is still extremely urgent, and will dominate school building policies for some time to come. In the case of the former, two special problems now face designers concerned with the quality and versatility in use of a standard system:

(i) school is seen (by Groups 1 and 2 for instance) as a complicated matrix of interrelated activities, some of which can be described as education and others as the ordinary pursuit of living; the facility to vary these activities and their relationships is becoming increasingly necessary as new areas of study and experience emerge within the school curriculum; educationists therefore need to be convinced that standard systems can develop the sophistication necessary to meet these more exacting demands;

(ii) recent growth in the concept of educational building becoming a community facility is making increasing demands upon the versatility of standard systems already in use; the shared use of cultural, recreational and leisure facilities by schools and the public generally (see Figure 6), poses design problems which differ from those normally found in a school brief.

These issues, raised by several groups, are pertinent to any discussion about the broader application of standard systems of building, particularly in new town developments.

The Reasons for a Variety of Solutions

54. Groups 5 and 6 reviewed the solutions adopted in the countries represented. They differed from one another on a number of counts:

(i) in the educational objectives underlying them; these can, for instance, vary from a demand for simple class spaces to a complex arrangement of learning facilities to match a great variety of related activities;

(ii) in their technical aspects; these range from a rationalisation of site operations to a radical reduction of such operations through the assembly of factory-made components;

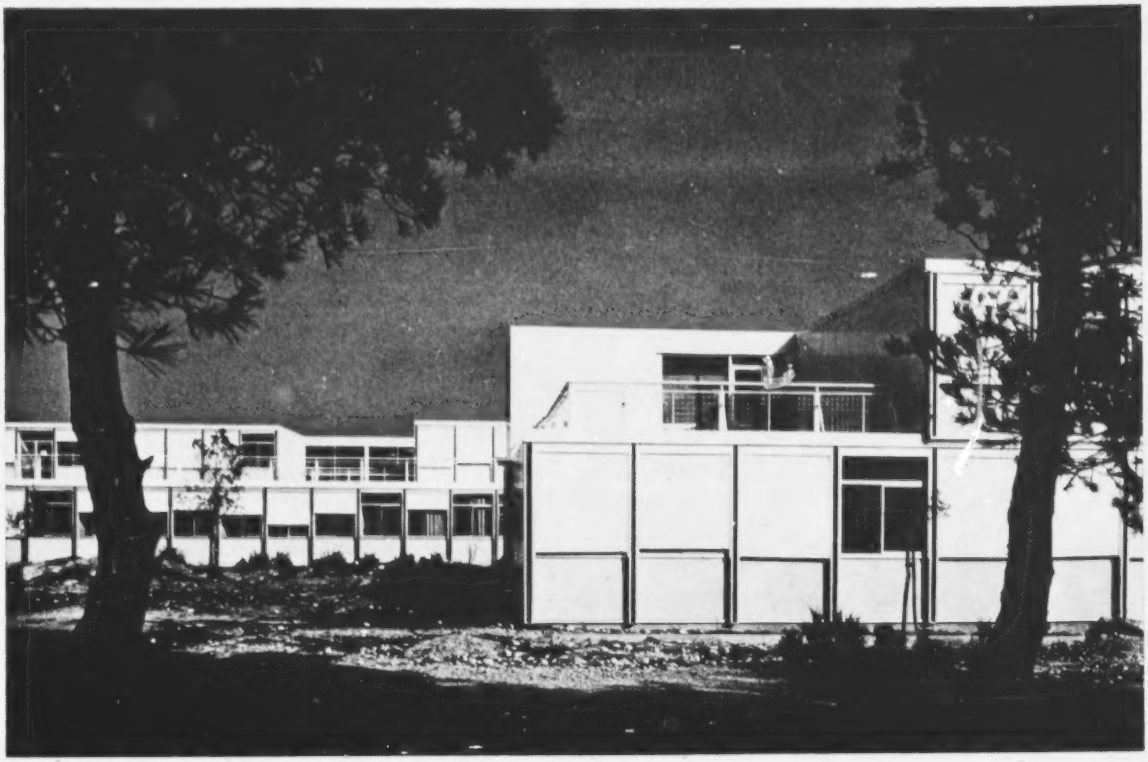

Figure 6 : An example of a school and community facility built in an industrialised building system.

(iii) in their architectural aspects; these vary from the adoption of a standard plan for a given type and size of school, repeated as required, to the use of a standard system of components, selected and arranged by an architect in an individual design, with a minimum of constraints;

(iv) in their administrative aspects; while in some countries the conventional procedures for the appointment of architects and the designation of contractors have determined the methods, in others, greater consistency with the chosen method has been achieved through amended statutory building regulations and administrative practices.

55. The different solutions adopted are not casual but emerge from differences of geography, economy and social structure as between one country or region and another, and from differences in their political and administrative institutions. For example, the degree of centralisation or of local autonomy, the relative responsibilities of educational and public works' authorities and the degree to which a local community is able to participate in the design processes, all affect the methods of building

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adopted. There are also differences in the character and constitution of the agencies initiating and developing the systems; for example, a system may be developed by a public authority, a specially constituted design team or by industry itself. Finally, there are differences in educational systems, in types, sizes and age-ranges of schools and in the regulations and practices affecting school projects.

56. Such variations indicate the impossibility, and indeed the undesirability, of finding a generally applicable solution. Any attempt to transplant a building system from the circumstances in which it originated into an entirely new situation is not likely to succeed. The development of a new system for designing, procuring and building schools in any country or region provides a unique opportunity to examine its institutional framework, the organisation and methods of education which prevail, the legal and administrative constraints which affect school building and any design or building practices which operate there. Such an appraisal would indicate the reforms desirable in order to achieve the full benefits conferred by the building system, not only in terms of time and cost but in the quality and suitability for their purpose of the resulting schools. The system must warrant the allocation of financial and manpower resources not only to its initial development but to its continuous modification or sophistication as demands change.

57. The groups discussing this topic placed particular emphasis on the following points:

(i) in the discussion of tasks, right from decision-making to implementation, the relative roles of administrator, educationist, architect, engineer, manufacturer and builder need to be determined; while their special functions will vary in magnitude from one stage of planning to another, their lines of communication should remain open;

(ii) educationists (including teachers) need to become more aware of the educational potential of variation in the use of space, if they are to exploit it fully;

(iii) in the development of any standard system, priority must be given to educational requirements; arrangements are needed for educational expertise to be available at all design stages from the inception of the system to the choice of furniture and equipment;

(iv) system building does not necessarily depend on large investment programmes, as instances of successful small-scale developments

are known; in all circumstances however, the constant improvement of the system depends upon a process of continuing evaluation, feedback and development;

(v) improvement in terms of value for money depends on the establishment of adequate standards and procedures for control and evaluation;

(vi) savings in time may be an important motive for adopting a standard system; these can also be achieved by overhauling the planning and administrative procedures as well as the site operations;

(vii) repeated standard projects are difficult to reconcile with local involvement in school design; in the circumstances where local educational experience is particularly valuable or innovative, then design for purpose suffers;

(viii) the great variety of existing and possible solutions and new developments always taking place make it imperative for countries to exchange and compare experience and information as frequently as possible.

The Special Nature of the Dialogue for Standard System Building

58. Those discussing this topic appear to have assumed a relationship and a dialogue among collaborators using a standard system very similar to that which operates for a school building project designed on non-system or traditional lines. How then do the circumstances of designing and using a standard system differ, and what special measures are necessary to ensure the most effective working arrangements? The preliminary paper on the topic identifies three main parties as being concerned with such a building project, namely, the designers of the system, the designers of an individual school building and the educationists who are to be the actual users. A standard system must gain acceptance from architects who are designing schools for particular clients making specific educational demands, and the choices it offers must be sufficiently variable to meet different educational briefs. This must inevitably generate a continuous flow of comment and criticism from the users of the system to its designers and back again. The architects of individual schools may shelter behind the limitations imposed by a system and fail to satisfy their clients. Alternatively, they may reject the system as unsuitable for their purposes, provided they are free to do so. Very special institutional arrangements are therefore necessary to open up essential lines of communication so as to maintain understanding of the potentialities of

the system on the one hand, and to secure a continuing process of development to match changing educational needs on the other. Some of the benefits resulting from the use of a standard system are dependent upon the skill and experience of architects and builders in using it. Such skill needs to be actively promoted. Users of the system need the support of a continuous flow of publicity from the designers to enable them to adapt modifications immediately they are available. Because countries, regions and localities have different needs, and because people are individually different, then education needs a great variety of facilities from which to choose, and a technology which adds new possibilities to the choices for living and learning in a school is therefore to be encouraged and developed.

VII. RESEARCH AND DEVELOPMENT

The Necessity for Research and Development

59. Though this topic was specifically assigned to Group 7, all groups commented on the need for research and development to serve their particular ends. Those concerned with briefing favoured an approach to design through an analysis of actual and foreseeable school activities and recommended that further study be made of the social interactions of children with their environment. Those dealing with future change, and particularly with the need for school building to achieve flexibility and economy in use, advocated further investigation and development into building types which are adaptable to varying forms of school organisation and teaching methods. Those concerned with building methods saw the need for standard systems to evolve alongside the changing educational objectives and practices. There is hardly an aspect of school construction where science and industry have not been brought into partnership with educationist, architect and builder in seeking fresh solutions to old, as well as new, problems. To quote from Guy Oddie(1): "in every direction, new or unusual requirements will prompt the need for innovation. This innovation, to be effective, will require inventive imagination which cannot be left to routine mechanisms. It demands not only the acceptance of change but enthusiasm for it." This enthusiasm, which is the very dynamic of school building, is to be found within the research and development groups now working in a few Member countries.

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(1) Guy Oddie, School Building Resources and their Effective Use, OECD, Paris, 1966, page 17.

They operate in different ways and at different levels in their relationship to normal school building practice and make an invaluable contribution towards securing the most effective use of resources to meet new objectives. The future may well dictate that people's expectations for education, leisure, health and security may have to be provided from far less massive capital investments than are now deemed necessary, and a far greater expenditure of human thought, ingenuity and labour on the problems they pose.

60. Enquiry within the group revealed great diversity from one country to another in the research and development carried out for school building. Some countries have wide experience of research and development over a long period while the experience of others is only recent, partial and even embryonic. Its form also varies according to the degree to which institutional arrangements are centralised or decentralised. Although it is impossible and even undesirable to formulate a mode of research and development applicable in all circumstances, the group was able to explore common ground and reach a considerable measure of agreement.

61. Innovation in the field of education and innovation in school building to meet social change do not always coincide. The adjustment of one to the other, which is neither in the field of technical nor educational research, needs to be an object of special study. In many countries there tends to be a widening gap between educational change and innovation in school building to meet it. As educational change accelerates, so the danger of our being unable to meet the demand for renewal becomes more acute. A continuing process of innovation and evaluation is a necessary dynamic in school building. National policies need to ensure that financial resources are made available not only for normal school building procurement, but also for the research and development necessary to feed it.

Research and Development Defined

62. Research in school building is largely applied research. It is located at the intersection of research conceived as an autonomous activity, with the practice of innovation in school building. Development work links research with everyday building practice. It takes scientific theories and techniques evolved under controlled laboratory conditions, and applies them to school building problems where they are subject to the influences of economic, industrial and commercial factors which affect their use. For example, research in the field of psycho-physics helps to define the most beneficial physical conditions for work in school,

and development then seeks the best solutions within the cost available. Development then becomes the integration of all available knowledge - educational, social, scientific and technical - applied in school building projects. During the course of development new problems are encountered on which further systematic research is essential. These may be referred to specialised research institutes (e.g. national building research agencies) or to appropriate university departments. Systematic evaluation of innovatory projects, and dissemination of the results, is also an essential part of development processes.

63. There was some discussion on the merits of two approaches to research: the first through an exhaustive scientific analysis of the problems involved and the second on pragmatic lines founded on an intuitive knowledge of the problems. In some countries, for example, architects and educationists visit schools together and observe the actual practice of teachers in various educational situations. They have also observed the spontaneous improvisations and adaptations made by inventive and imaginative teachers to assist innovatory methods being adopted. These are pointers to their real needs for which the designer's special skill is being recruited. Empirical observation, however responsible and detailed it may be, is rarely enough, though it often provides essential starting points for design which is basically concerned with the human needs of a community of teachers and pupils. Problems of detail inevitably arise which need the support of scientific investigation to achieve the most advantageous solutions, and the intervention of experts from research or technical institutions then becomes necessary. Design is a synthesis of knowledge and ideas fed from almost limitless sources.

64. Individual countries were left to determine the approach most appropriate to their own circumstances, but agreement was reached on the following conditions for research and development:

- Research in school building, already defined as applied research, is only effective insofar as its results are re-invested either in further development projects or in some other form of concerted action. This is the spiral of events referred to by Groups 1 and 2.
- Research must extend beyond the observation of innovatory experiences and beyond the dialogue between architects and educationists, though both are fundamental. The evaluation of projects presupposes a certain scientific rigour, with other experts involved in the dialogue (e.g. economists, sociologists and psycho-physicists).

- Research and development must achieve results, even if incomplete, within relatively short periods of time. Despite the slow pace of research, the dissemination of its findings should not be postponed. School building cannot afford to wait for complete answers to the problems it poses, and day-to-day school design and building must proceed on the basis of provisional or even tentative recommendations and findings. Speedy dissemination of information is essential to the efficiency of the service which research and development agencies render to normal school building production.

Institutional Arrangements for Research and Development

65. Research and development takes place at three levels: a local level, a regional level and a central government level. Examples quoted included the work in a Swiss municipality, the regional initiatives fostered in Sweden and the central agencies which operate in England and the Netherlands. These levels are partly determined by the degrees to which institutional arrangements are centralised or decentralised. The levels of operation are also partly a question of scale; for example, research of considerable scope is only possible where the necessary expertise and resources can be mobilised and where a sufficiently large building programme justifies the scale of expenditure. It should be said, however, that the degree to which research and development is at present centralised or decentralised is often dependent upon existing institutional arrangements.

66. Local and regional arrangements tend to suffer from their isolation, the dispersal of their efforts and their lack of means. The group strongly favoured the establishment of central agencies for research and development. They are more able to promote and co-ordinate the necessary research studies, to mobilise the expertise required, to provide the impetus for innovation and experimentation and to influence the whole production of school buildings through the broad dissemination of their findings. Although the countries represented in the group varied in their administrative structures, they have all either created or intend to create central agencies for the promotion of research and development. The building of a new school is an event of some importance to a local community and it is here that enthusiasm for the innovation incorporated needs to be generated. Greatest success will be achieved where effective working relationships are established between the central agency and local or regional building projects so that there is a continuous flow of information and evaluation between one and the other.

67. A supplementary level is now becoming apparent, namely the international level. The exchange of information and experience would be especially beneficial to countries unable to divert sufficient resources to research and development and who otherwise might tend to fall behind in their struggle with the problems of change. To this end, co-operation might go beyond the exchange of information to the shared organisation of development projects.

68. Discussion took place on the degree of autonomy required by a central mechanism for research and development. Some saw research and development as a service essential to the central administration of education. Others believed it should be organised as a national development agency with a certain degree of autonomy, rendering it independent of policy-makers who might merely use it as a means of justifying and reinforcing their own decisions. It was agreed that whatever the arrangements, research and development could only be effective if conducted in close consultation with policy-makers. Research which is not linked to decision-making has but little credibility in the field of school building, and isolated experimental projects have hardly any effect on development. The main problem is to establish an effective dialogue without the subordination of either party to the other.

69. The characteristics and functions of a central agency were seen as follows:

- it should be lightly structured, say ten to fifteen people, and should be multi-disciplinary; its role would be to animate working groups whose composition would vary according to the character and demands of the projects undertaken; it would thus be possible to draw upon the necessary skills without making the structure of the mechanism too heavy;
- its main function would be to develop innovation and apply research in actual building projects; it must not merely perform a co-ordinating and informing role;
- the solutions it disseminates should not be definitive or mandatory; they should be used for guidance only;
- it may sometimes need freedom to test the constraints under which school building operates.

Thus, the research and development mechanism has both a leadership and a servicing role to play in guiding and supporting those responsible for implementing school building programmes.

70. In conclusion, the members of Group 7 agreed on the need to take the initiative, in each of their countries, to establish research and development where it does not exist, and to improve it where it does. These iniatives should take the form of actual building projects organised on development lines for the building of schools already programmed. PEB could contribute to the success of such initiatives firstly, by attempting to persuade the political authorities of the countries concerned of the value of research and development, and secondly, by disseminating much more information on development projects carried out in various countries, and on research and development activity generally. This information should draw attention to the research and development processes by which the results had been achieved, and make full details available to Member countries.

VIII. SCHOOL BUILDING AND THE TEACHING PROFESSION

71. Though this was not a special topic of discussion at the Symposium, all groups either commented upon or made recommendations about the apparent lack of understanding shown by teachers of the problems of designing and building new schools in the context of change. Teachers are often critical of the innovations made by architects, and architects are equally criticial of the failure of teachers to use these effectively in their day-to-day practice. Perhaps it is opportune to examine this situation and to consider what can be done to promote greater understanding. Let us consider the problem of mobilising informed teacher opinion in support of educational innovation, and particularly in creating the physical conditions in which it can flourish.

72. Are we satisfied with the nature and composition of interdisciplinary teams set up to brief, design and build new schools and to conduct the research necessary to the innovatory developments to be incorporated? In these circumstances, what constitutes the educational voice? The term "educationist" is capable of very wide interpretation. It may be someone at the conceptual or policy-making level of education who has little practical knowledge of the actual processes of teaching and learning and the complexity of the physical arrangements in which it functions. Alternatively, it may be someone with executive ability in implementing such arrangements but with little concept of the broad educational planning issues involved. Finally, it may be a practising teacher, the value of whose contribution will depend on his vision as to pedagogical trends, and

the breadth and quality of his own experience. Guy Oddie(1) has defined the educationist in school building terms as "someone who is familiar with the broad strategies and objectives of educational development but who, at the same time, is familiar with the daily problems of practical teaching and with any current innovations which attempt to solve them". But is familiarity enough in the rapidly changing circumstances of today? The definition served design teams well ten or more years ago, but it is no longer within the capacity of one person to perform fully and efficiently the tasks which have been expected of the educationist in the past. Continuous tapping of the well of experience in the shape of those teachers at the spearhead of educational innovation is now essential to the work of design teams. These people work largely by intuition, are not always articulate and are sometimes to be found in obscure places. In what form can this educational voice be sounded?

73. It must be recognised that the great majority of teachers work either in old buildings or in post-war buildings designed to traditional school organisation and teaching methods. Only a small proportion are ever concerned with the building of a new school, or work in environmental conditions or with facilities which can be described as innovatory. It is not surprising therefore that the teaching profession is largely unconcerned with the problems facing designers of new schools and that so few of its members are able to comprehend the language and attitudes of those engaged in the dialogue of briefing and design. The Education Committee of O.E.C.D. is currently turning its attention to the major problem of the changing context of the professional activity of teaching and is asking itself the question "... how can the role of the teaching profession, hitherto deeply rooted in historical and cultural traditions, be made to evolve to meet new needs?". The question involves a study of the future role of the teacher within the whole human and physical environment in which education operates. Educational Building needs to construct its own special bridges linking it with the teaching profession to make the briefing dialogue more fruitful than hitherto. Design teams need to be seen in touch with the practice of teaching at the frontiers of education.

74. Teachers have tended to adopt an attitude towards space problems, that is, any new activity requires new space and facilities to be added to the old. Rarely have they been prepared to consider new forms of space distribution in the interests of greater variety of facility. Now

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(1) Development and Economy in Educational Building. OECD, Paris, 1968, page 13.

however, the teaching profession is being called upon to commit itself to permanent participation in adapting educational systems to fulfil new functions. To translate this into real terms, the teacher must be accepted into mechanisms of participation and dialogue which enable him to comprehend and discuss major innovations to be introduced, not only in school building but in everything affecting education. This movement has begun already in some countries and is now gathering momentum.

75. Two major issues face the teaching profession:

- the first is the difficulty they find in reconciling two apparently different sets of values, one an ideology concerned with the education of an individual and based on psychological and sociological theory, and the other a veneration for intellectual processes and a belief in the paramount importance of academic standards;
- the second arises from the idea of creating a new form of school open to people as a whole, and with it the necessity to institute a permanent dialogue between those operating school establishments and the rest of society.

These are also fundamental issues for school design. For teachers however, the second involves the surrender of their sole responsibility for the transmission of knowledge and learning and an acceptance of the notion of the "parallel school", i.e. the growing programme of educational activities taking place outside the formal school organisation and available to the whole community. Though innovating architects may foresee such changes, and design an environment and facilities to encourage them, their acceptance by the majority of the teaching profession is likely to be guarded, at least for some time to come.

76. The education authorities who employ teachers, and the profession itslef, are seeking ways of helping teachers to adjust to their changing role. As they become more accustomed to the idea of a more open education in which the individualisation of learning, the social needs of children, and the participation of people outside the normal school establishment are all accepted within a new institutional framework, so will they co-operate in its development. This has important implications for educational building. If a teacher is to play a more active role in innovation, then he requires a working environment in which he can experiment with new organisational arrangements and teaching practices, and new media to assist learning processes. But a much more important problem is how to enable the thousands of teachers in out-of-date buildings to

adapt innovations originating in new, purpose designed buildings to the realities of their own physical circumstances. When financial resources are restricted, how can we help innovating teachers to improvise such new arrangements as they require?

77. Group discussions yielded such questions as "what is done in teacher-training establishments to make students aware of the opportunities afforded by some of the most recently designed school buildings"? or "are in-service training courses available to experienced teachers to inform them of new educational objectives and methods and the facilities now being provided to meet them"? Most national governments now recognise that the content and mode of training received by teachers once-and-for-all at the beginning of their careers, and which may determine their attitude towards education, no longer enables teachers to cope with the different types of change which now continuously affect schools. Members of school building design teams, whether participating in research and development work or implementing school building programmes, should therefore consider what contribution they can make to both the initial and in-service training of teachers, so that they become increasingly aware of the potential for educational change which buildings and their facilities can offer. In so doing, they will encourage teachers to exercise a critical appreciation of the functioning of the whole school milieu, and thus help to mould a body of informed teacher opinion in matters pertaining to the whole educational environment. To be successful, this work will rely heavily on the educational performance of the most recently built schools. It is therefore of first importance that the teaching staffs using them are fully aware of the objectives of the designers, and are prepared to test their performance in these terms.

78. PEB could suggest to governments and other national institutions ways of informing and influencing a larger section of the teaching profession in school building matters. Ideas and comments emerging from the wide discussions at the Symposium suggest that the following might be considered:

(i) organising visits of students and experienced teachers to new schools with innovating features; they would need to be accompanied by members of the design team or, alternatively, the ground should have been well prepared beforehand by the design team;

(ii) including experienced teachers in groups formed to appraise the use of newly designed facilities; they could also study improvisations made to the learning environment by teachers in old buildings and help to formulate plans for making old buildings more flexible in use;

(iii) engaging students in practical work which involves the arrangement and re-arrangement of furniture and facilities in learning areas (through work with models if possible); they could, for instance, experiment in evolving new sets of work-places to match new activity patterns;

(iv) helping the most inventive teachers, particularly those who might eventually join design teams, to understand the constraints which operate in educational building. There are two aspects of this problem:

- firstly, that of comprehending the technical language used by architects, engineers and quantity surveyors as well as interpreting their graphical solutions to design problems;
- secondly, understanding the influence of the constraints themselves i.e. of cost control or the operation of statutory building regulations.

79. There tends to be a much larger circulation of the publications of research and development agencies among technical professional people than among teachers. To widen the readership, special attention might be paid to two points:

- that the material assembled and the style of its presentation be particularly suited to a teacher readership; for example, the educational aspects of a new design, and a record of the discussions out of which the particular design solution emerged, could be presented separately;
- that such publications should not only be available at all teacher-training centres but should form an integral part of the studies of at least some of the students.

There may be a strong case in future for appointing at teacher-training centres, and especially at those conducting in-service courses, tutors with special knowledge and experience of the problems concerned with the physical environment of education.

POSTSCRIPT

80. During the last twenty years, school building has emerged from a routine, down-to-earth preoccupation to an enterprise concerned with the development of the human spirit. The whole spectrum of educational

requirement is broadening as we become conscious of new aspirations everywhere. The purpose of education is the fulfilment of each human personality and educational building is the creation of the environment in which it can grow. But we also know that as individuals are different, so are their needs, and that equality of opportunity does not necessarily mean the same set of opportunities for everybody. In our enthusiasm for particular objectives, it must be remembered that time moves swiftly and that events often overtake the solutions we favour and render them invalid.

81. Doubts now emerge about the validity of the comprehensive or multi-option school. It is a highly expensive instrument in terms of more highly equipped buildings, a more highly paid teaching profession and generous staffing ratios. Few people may question the multi-option principle, but multi-option schools are not essential to the operation of multi-option arrangements for education. Even the idea of the community school is losing some of its appeal as people reject the notion and image of "school" as a suitable forum for their adult activities. The realisation of multi-option objectives for people as well as for boys and girls in school, may lie in totally different institutional and management structures.

82. While we cannot foresee the future, we can be aware of significant trends and consider what their effects might be. The public voice is unlikely to modify its demands for greater social opportunity and it is equally unlikely to accept less than its expectations for the education of its children and young people. Eventually, ends and means must be reconciled, and it is in this area that the major problems of educational building still lie.

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Figures 1, 2 and 3 : By courtesy of Alexander B. Leman, Leman Group Inc., Toronto, Ontario (Canada).

Figure 4 - Project : Keyworth Secondary School, the Lower School - Stage 1, Keyworth (Royaume-Uni)

Architects : Nottinghamshire County Architect's Department, County Architect : H.T. Swain.

Drawing : By courtesy of the Nottinghamshire County Council.

Figure 5 - Project : Maiden Erlegh Secondary School, Earley (Royaume-Uni)

Architects : The Development Group, the Architects and Building Branch, Department of Education and Science London.

Photograph : Architects and Building Branch, Department of Education and Science, London.

Figure 6 - Project : Centre éducatif et culturel, Les Heures Claires, Istres (France).

Architects : P. Riboulet, G. Thurnauer, J.L. Véret.

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